

A CHECKLIST OF THE STONEFLIES (PLECOPTERA) OF VIRGINIA¹

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ABSTRACT: This first comprehensive list of the stoneflies of Virginia records 116 species, including 40 new state records. An additional 21 species that are believed to occur in the state, but have not yet been collected, are also listed. The diversity of biotic associations resulting from the geographic position of the state is probably responsible for the large number of species. The literature containing records of stoneflies and the most applicable taxonomic works for identifying stoneflies from Virginia are reviewed.

From 1976 to 1979 we collected adult stoneflies from many sites in Virginia as part of an ongoing survey of the aquatic insects of the state. This checklist is the first comprehensive summary of the stoneflies of Virginia. Smrcek (1973) listed 70 species from the state, but many of her records were obtained from the literature, and many of her species determinations were based on larvae. Previous records of stoneflies in Virginia are scarce and scattered in the literature. There is no single comprehensive reference which can be used to identify all of the species of stoneflies occurring in Virginia. The fauna of Virginia includes many species which are not included in taxonomic works for other states such as Connecticut (Hitchcock, 1974), Florida (Stark and Gaufin, 1979), Illinois (Frison, 1935), and Pennsylvania (Surdick and Kim, 1976). In addition, several new species that occur in Virginia have recently been described (Kondratieff and Voshell, 1979; Nelson and Kondratieff, in press). Therefore, the purpose of this paper is to provide a complete and up-to-date checklist of the stoneflies of Virginia so that workers in this geographic area can determine the applicability of existing taxonomic literature.

In this checklist we follow the classification of Zwick (1973) as reviewed by Baumann (1976). A total of 9 families, 40 genera, and 116 species are included that have been collected or examined by the authors or that have been reported from Virginia in reliable literature sources. Forty new state records are indicated by #. Species that we have not yet collected, but are reported from Virginia in the literature, are indicated by *. In addition to the 116 species that have been confirmed to occur in Virginia, this checklist includes 21 species that we believe to occur in Virginia because they have been reported in adjacent states; these are indicated by Δ, and the states where they have been collected are listed in parentheses.

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The 116 species reported herein from Virginia is among the highest number of species reported from a single state in the United States. The number of species occurring in Virginia is approximately the same as that reported by Gaulin and Ricker (1974) for Montana (119). Considerably fewer species have been reported in several southern states: Florida - 26 species (Stark and Gaulin, 1979); Louisiana - 24 species (Stewart, et al., 1976); Texas - 28 species (Szczytko and Stewart, 1977). Fewer species have also been reported in two northeastern states: Connecticut - 74 species (Hitchcock, 1974); Pennsylvania - 90 species (Surdick and Kim, 1976). In the adjacent state of West Virginia various authors (Farmer and Tarter, 1976; Hissom and Tarter, 1976; Kirchner, 1978; Steele and Tarter, 1977; Tarter, et al., 1975; and Tarter, et al., 1976) have reported at least 95 species.

The richness of stonefly species in Virginia is probably indicative of the favorable biogeographic position that the state occupies on the eastern seaboard of the United States. The most complete discussion of biogeography in Virginia can be found in Hoffman (1969). He wrote that "the state embraces no less than five of the major physiographic provinces of eastern United States, with a resultant diversity of topography and habitat types", and that "through the combination of latitudinal location (36.30 to 39.30 N) and a considerable range of vertical relief (sea level to 5,720 feet), a variety of biotic associations determined primarily by climatic factors is found within the political boundaries of Virginia." In addition, there are eight river basins in Virginia, several of which are components of old and geographically significant river systems. The richness of the state fauna is illustrated by two significant range extensions reported in this checklist. *Alloperla idei* was previously reported only from Quebec, and *Allocapnia illinoensis* was previously reported only from Illinois, Maine, Minnesota, New York, Ohio, Ontario, Quebec, and Wisconsin. In summary, it appears that Virginia is a most interesting location for taxonomic and distributional studies of stoneflies and other aquatic insects.

Specimens were examined from the collections of Virginia Polytechnic Institute and State University, the United States National Museum, and Mr. Ralph F. Kirchner. The following references contain records of stoneflies from Virginia: Banks (1904); Baumann (1973, 1974, 1975); Claassen (1931); Frison (1935, 1942); Hanson (1941); Harden and Mickel (1952); Hitchcock (1974); Illies (1966); Needham and Claassen (1925); Ricker (1949, 1952); Ricker and Ross (1968, 1975); Ross and Ricker (1971); Stark and Gaulin (1974, 1976a, 1976b); and Zwick (1973). The taxonomic works that are most applicable for identifying stoneflies collected in Virginia are: Frison (1935, 1942); Hanson (1941); Hitchcock (1974); Needham and Claassen (1925); Ricker (1952); Ricker

and Ross (1968, 1975); Ross and Ricker (1971); Stark and Baumann (1978); and Stark and Gaufin (1976a, 1976b).

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Order Plecoptera, Suborder Arctoperlaria

Group Euholognatha Superfamily Nemouroidea Family Nemouridae

Subfamily Amphinemurinae

- # *Amphinemura delosa* (Ricker) # *A. wui* (Claassen)
A. usgritti (Provancher)

Subfamily Nemourinae

- | | |
|---|---|
| # <i>Ostrocerca albidipennis</i> (Walker) | <i>P. similis</i> (Hagen) |
| Δ <i>O. complexa</i> (Claassen) (WV) | # <i>Shipsa rotunda</i> (Claassen) |
| Δ <i>O. prolongata</i> (Claassen) (WV) | <i>Soyedina carolinensis</i> (Claassen) |
| # <i>O. truncata</i> (Claassen) | <i>S. vallicularia</i> (Wu) |
| # <i>Paranemoura perfecta</i> (Walker) | Δ <i>Zapada chila</i> (Ricker) (TN) |
| <i>Prostoia completa</i> (Walker) | |

Family Taeniopterygidae

Subfamily Brachypterinae

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|---|--|
| # <i>Bolotoperla rossi</i> (Frison) | # <i>S. limata</i> (Frison) |
| <i>Oemopteryx contorta</i> (Needham and Claassen) | <i>Taenionema atlanticum</i> Ricker and Ross |
| <i>Strophopteryx appalachia</i> Ricker and Ross | |
| <i>S. fasciata</i> (Burmeister) | |

Subfamily Taeniopteryginae

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|--|-----------------------------------|
| <i>Taeniopteryx burksi</i> Ricker and Ross | <i>T. metequi</i> Ricker and Ross |
| Δ <i>T. lita</i> Frison (NC, TN) | <i>T. parvula</i> Banks |
| # <i>T. lonicera</i> Ricker and Ross | # <i>T. ugola</i> Ricker and Ross |
| <i>T. maura</i> (Pictet) | |

Family Capniidae

- | | |
|-------------------------------------|-------------------------------------|
| <i>Allocapnia aurora</i> Ricker | <i>A. nivicola</i> (Fitch) |
| Δ <i>A. brooksi</i> Ross (TN) | <i>A. pygmaea</i> (Burmeister) |
| # <i>A. curiosa</i> Frison | <i>A. recta</i> (Claassen) |
| Δ <i>A. forbesi</i> Frison (TN, WV) | <i>A. rickeri</i> Frison |
| # <i>A. frisoni</i> Ross and Ricker | Δ <i>A. stannardi</i> Ross (NC, TN) |
| Δ <i>A. fumosa</i> Ross (NC, TN) | <i>A. virginiana</i> Frison |
| <i>A. granulata</i> (Claassen) | * <i>A. vivipara</i> (Claassen) |
| # <i>A. illinoensis</i> Frison | <i>A. wrayi</i> Ross |
| <i>A. loshada</i> Ricker | <i>A. zola</i> Ricker |
| * <i>A. maria</i> Hanson | <i>Nemocapnia carolina</i> Banks |
| * <i>A. mystica</i> Frison | <i>Paracapnia angulata</i> Hanson |

Family Leuctridae

Subfamily Megaleuctrinae

- | | |
|-----------------------------------|------------------------------------|
| <i>Megaleuctra flinti</i> Baumann | Δ <i>M. williamsae</i> Hanson (TN) |
|-----------------------------------|------------------------------------|

Subfamily Leuctrinae

- | | |
|-----------------------------------|--|
| <i>Leuctra alexanderi</i> Hanson | Δ <i>L. nephophila</i> Hanson (NC, TN) |
| # <i>L. biloba</i> Claassen | <i>L. sibleyi</i> Claassen |
| # <i>L. carolinensis</i> Claassen | <i>L. tenuis</i> (Pictet) |
| # <i>L. duplicata</i> Claassen | # <i>L. triloba</i> Claassen |
| <i>L. ferruginea</i> (Walker) | # <i>L. truncata</i> Claassen |
| # <i>L. mitchellensis</i> Hanson | # <i>L. variabilis</i> Hanson |
| # <i>L. monticola</i> Hanson | <i>Paraleuctra sara</i> (Claassen) |

Group Systellognatha

Superfamily Pteronarcyioidea

Family Pteronarcyidae

- | | |
|-----------------------------------|----------------------------------|
| <i>Allonarcys biloba</i> (Newman) | <i>A. scotti</i> (Ricker) |
| <i>A. comstocki</i> (Smith) | <i>Pteronarcys dorsata</i> (Say) |
| <i>A. proteus</i> (Newman) | |

Family Peltoperlidae

Subfamily Peltoperlinae

- Peltoperla arcuata* Needham Δ *Viehopera zipha* (Frison) (NC)
P. maria Needham and Smith

Superfamily Perloidea

Family Perlodidae

Subfamily Iosperlinae

- Iosperla bilineata* (Say) # *I. namata* Frison
I. clio (Newman) # *I. orata* Frison
I. dicala Frison *I. signata* (Banks)
I. holochlora (Klapalek) *I. similis* (Hagen)
I. lata Frison *I. slossonae* (Banks)
I. marlynia Needham and Claassen Δ *I. transmarina* (Newman) (WV)

Subfamily Perlodinae

- Cultus decicus* (Walker) *Malirekus hastatus* (Banks)
Diploperla duplicata (Banks) # *Remenus bilobatus* (Needham
and Claasen)
D. morgani Kondratieff and Voshell # *Yugus arinus* (Frison)
D. robusta Stark and Gaufin *Y. bulbosus* (Frison)
Helopicus subvarians (Banks)
Isozenoides hansonii (Ricker)

Family Chloroperlidae

Subfamily Chloroperlinae

- Δ *Alloperla aracoma* Harper and Δ *A. neglecta* Frison (NC, TN)
Kirchner (WV) *A. usa* Ricker
A. atlantica Baumann *Hastaperla brevis* (Banks)
A. banksi Frison # *Suwallia marginata* (Banks)
A. biserrata Nelson and Kondratieff # *Sweltsa lateralis* (Banks)
A. caudata Frison *S. mediana* (Banks) (NC, TN)
A. chloris Frison *S. naica* (Provancher)
A. concolor Ricker # *S. onkos* (Ricker)
A. ideji (Ricker) # *S. urticae* (Ricker)
A. imbecilla (Say) Δ *Rasvena terna* (Frison) (TN, WV)
A. nanina Banks

Family Perlidae

Subfamily Acroneuriinae

- Acroneuria abnormis* (Newman) *A. lycorias* (Newman)
A. arenosa (Pictet) Δ *A. perplexa* Frison (WV, TN)
Δ *A. arida* (Hagen) (TN) *Attaneuria ruralis* (Hagen)
A. carolinensis (Banks) *Eccoptura xanthenes* (Newman)
A. evoluta Klapalek *Perlesta placida* (Hagen)
A. filicis Frison Δ *P. frisoni* Banks (NC, WV)
A. flinti Stark and Gaufin *Perlinella drymo* (Newman)
Δ *A. internata* (Walker) (WV) # *P. ephyre* (Newman)

Subfamily Perlinae

- Δ *Neoperla choctaw* Stark and *P. immarginata* (Say)
Baumann (WV) *P. media* (Walker)
N. freytagi Stark and Baumann *Phasganophora capitata* (Pictet)
Paragnetina fumosa (Banks)